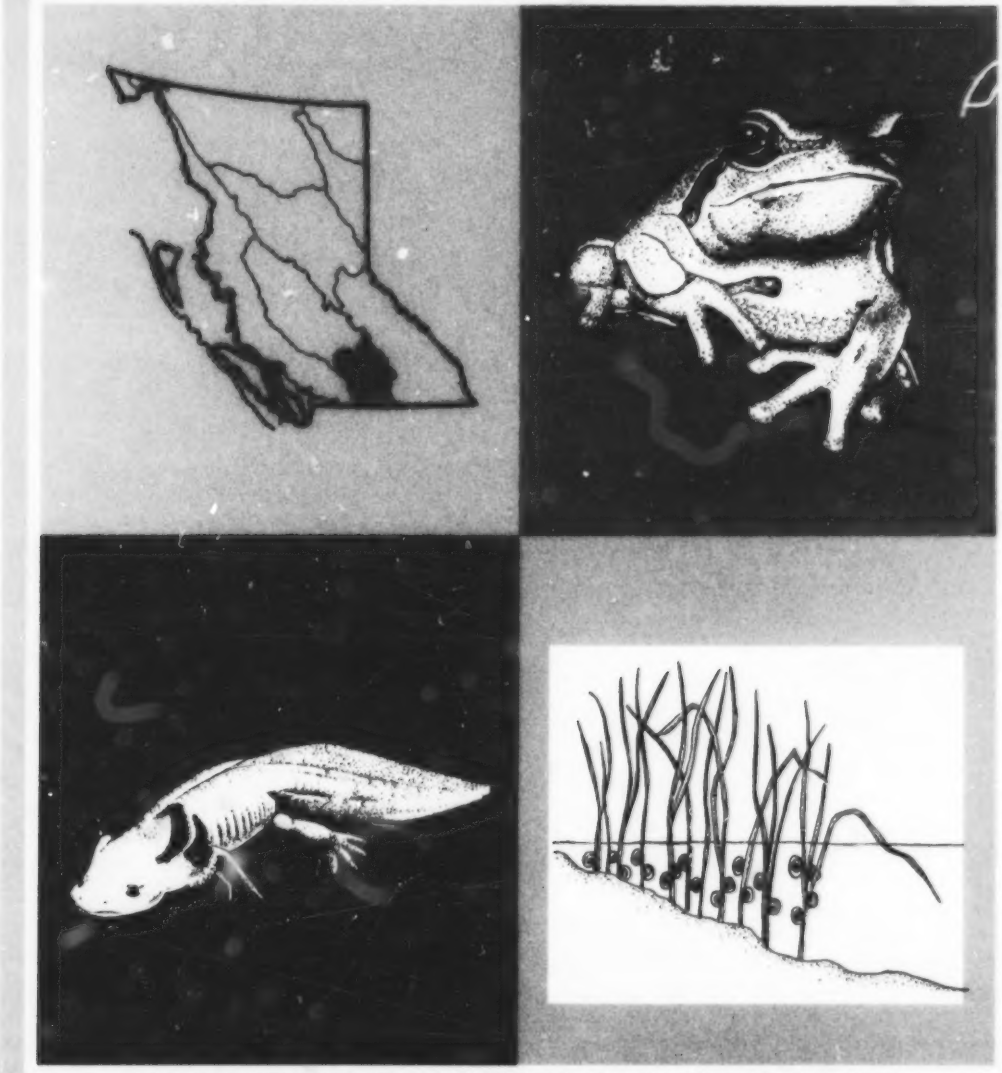
# WILDLIFE HABITAT Handbook

**for the Southern Interior Ecoprovince**



## Vol. 4 Species Notes for Amphibians

BC

Ministry of Environment Ministry of Forests

90-06820/

# WILDLIFE HABITAT HANDBOOKS FOR THE SOUTHERN INTERIOR ECOPROVINCE

## VOLUME 4: SPECIES NOTES FOR AMPHIBIANS

Stan A. Orchard

A cooperative effort of the
Ministry of Environment (Wildlife Branch),
the Ministry of Forests (Research Branch),
and Wildlife Habitat Canada

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Victoria, B.C.

Wildlife Habitat Research WHR-31
Wildlife Report No. R-18

1988

Copies of this report may be obtained,
depending on supply, from:

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Victoria, B.C.
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Public Affairs and Communications Branch
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*Citation: Orchard, S.A. 1988. Species notes for amphibians. Volume 4 in A.P. Harcombe (tech. ed.) Wildlife habitat handbooks for the Southern Interior Ecoprovince. Ministry of Environment and Ministry of Forests. Victoria, B.C. 41pp.*

**Canadian Cataloguing in Publication Data**

Orchard, Stan A.
Species notes for amphibians

(Wildlife habitat handbooks for the southern interior ecoprovince, ISSN 0847-0723 ; v. 4)
(Wildlife habitat research, ISSN 0825-2769 ; WHR-31)
(Wildlife report, ISSN 0829-7797 ; no. R-18)

Co-published by the Ministry of Forests Research Branch.
Includes bibliographical references.
ISBN 0-7726-0987-X

1. Amphibians - British Columbia - Habitat. I. British Columbia. Wildlife Branch. II. British Columbia. Ministry of Forests. Forestry Division. Research Branch. III. Title. IV. Series. V. Series: Wildlife habitat research ; WHR-31. VI. Series: Wildlife report (Victoria, B.C.) ; no. R-18.

QL654.0723 1989 597.6'09711 C89-092205-5

c 1988

# PREFACE

This publication is part of the series "Wildlife Habitat Handbooks of the Southern Interior Ecoprovince". The purpose of this series is to provide forest, wildlife, and range managers with the knowledge and tools to assess impacts of various land management practices on wildlife and its habitat. Basic to this assessment process is an understanding of wildlife's relationship to habitat.

The information in this series applies specifically to the Southern Interior Ecoprovince and similar ecosystems in the southern area of British Columbia. The principles and processes described, however, apply generally to all managed forests and rangelands, when the welfare of wildlife is affected by land management decisions.

The series is a comprehensive package composed of eleven separate volumes. Although each part will be an independent treatment of a specific subject, when combined in sequence, the individual parts will be as chapters in a book. The final sequence is shown on the inside back cover of this publication, but individual chapters will be printed as they become available. Though this ensures that the information will be used as quickly as possible, the order of production will not be the same as the final organized order.

"Wildlife Habitat Handbooks of the Southern Interior Ecoprovince" is a cooperative effort of the British Columbia Ministries of Environment (Wildlife Branch, Fisheries Branch), the Ministry of Forests (Research Branch), the Ministry of Municipal Affairs, Recreation, and Culture (Royal British Columbia Museum), the University of British Columbia and Simon Fraser University, and the Canadian Wildlife Service.

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Technical Editor
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# ACKNOWLEDGEMENTS

This wildlife habitat handbook volume was funded by the Research Branch of the Ministry of Forests, the Wildlife Branch of the Ministry of Environment, and Wildlife Habitat Canada (Communication and Education).

The production of this report depended strongly on the access to literature and specimens provided by the Vertebrate Zoology Division of the Royal British Columbia Museum, primarily through R. Wayne Campbell and on the editorial comments provided by P. Gregory and R.W. Campbell.

Much of the information in this report was obtained from two related projects - an ecological review of amphibians and reptiles of British Columbia (Orchard 1984) and a British Columbia atlas project (Orchard, in preparation).

I would like to thank Lynne Foxall for her long-suffering patience in typing this document. Spenser Sutton of Atlas Designworks drafted the distribution maps. Illustrations were done by Keith Taylor and Brigitta M. Van Der Raay for a museum handbook on amphibians (Green and Campbell 1984) and gratefully used here with permission from the Royal British Columbia Museum. Other graphics were prepared by Gail Harcombe and Glenn Kubian. Tracey Hooper and Elizabeth Stanlake did much of the report formating and editing. Cover design was by Nicholas Newback. To all contributors, I am grateful.

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# 1 Introduction

# 1. INTRODUCTION

The major wildlife goal in British Columbia is to maintain the diversity of species. This is a difficult goal to achieve with the large number of species, habitats, and land use activities. For most species, the desired information for management is scanty, scattered, and descriptive. Thus it is difficult to predict outcomes of land use practices on habitat and on wildlife, especially with few staff, low budgets, and high rates of habitat change.

The wildlife habitat handbook project was initiated to develop planning tools to aid wildlife habitat managers in predicting consequences of management activities on habitat and therefore on wildlife. Two major premises of this handbook are:

1) most wildlife habitat will be managed indirectly by influencing other resource managers to modify their activities for the benefit of wildlife;
2) all wildlife species and their habitat requirements must be considered in the process.

This handbook system organizes biological data for various ecosystems or habitats, in a framework that assists resource managers in predicting consequences and in developing alternatives. It is based on similar approaches to species diversity management in the United States. Our approach was to begin with a pilot study in the Southern Interior Ecoprovince (see Figures 1 and 2).

The following report is the "amphibian" component of the information base we call species notes [1]. These notes present knowledge of habitat requirements for terrestrial and aquatic vertebrates in a readable, understandable format. They summarize the literature describing the distribution, habitat requirements, and selected life history characteristics, from a *provincial* perspective, for the 8 amphibian species occurring in the Southern Interior Ecoprovince. The notes provide the literature data-base for developing the species-habitat relationship models that will indicate suitability values for wildlife species for each major wildlife habitat.

The species notes were compiled with an emphasis on information specific to British Columbia. The main source of information was the literature collected at the Royal British Columbia Museum for the amphibian bibliography (Campbell *et al.* 1982) and a report commissioned by the B.C. Forest Service (Orchard 1984). An extensive search of the information collected by the museum up to September 1984 was conducted. Since many species are not adequately covered in British Columbia studies, we used information from general amphibian texts along with other literature relevant to the Pacific Northwest. Some general texts are listed in Appendix 5.2. Additional information was provided by biologists who reviewed notes on species within their area of expertise (See Acknowledgements).

The species notes are starting points for information on the habitat requirements of amphibians in British Columbia. For some species, little information is currently available, as noted in regional wildlife planning documents. Information from future studies and field work can be incorporated into the wildlife habitat handbooks to update and refine existing knowledge.

### 1.1 Annotated Format of Species Notes

All species notes follow the same format, with information arranged under the following categories:

**Taxonomy:** each species note is headed by the common name, scientific name and taxonomic code, taken from Campbell and Harcombe (1985).

**Synonyms:** common names used in Green and Campbell (1984) are also given, since this reference may be used for species identification or additional biological information.

**Distribution, Seasonality and Abundance:** a summary statement of abundance and provincial distribution. Abundance is assessed within suitable habitat and rated subjectively by the terms abundant, common, sparse, and rare. Seasonality (or season of occurrence) is not applicable, since amphibian species are all resident.

**Habitat Requirements:** divided by three main life requisites:

**Reproduction:** includes information on courtship areas and reproductive sites (nesting or denning).

**Feeding:** includes information on food habits, foraging substrates and foraging cover.

**Special Needs:** includes information on roosting/resting sites, hiding/escape cover, thermal cover, and hibernation/aestivation sites.

Within each of these broad categories, habitat requirements are subdivided into habitat classes and specific habitat elements.

**Habitat Classes:** in some cases, information from the literature allowed only general habitat classes to be used whereas more detailed habitats could be described for other species that have been studied extensively (Harcombe and Lea, in prep.).

[1] also called species narratives or species profiles in other reports

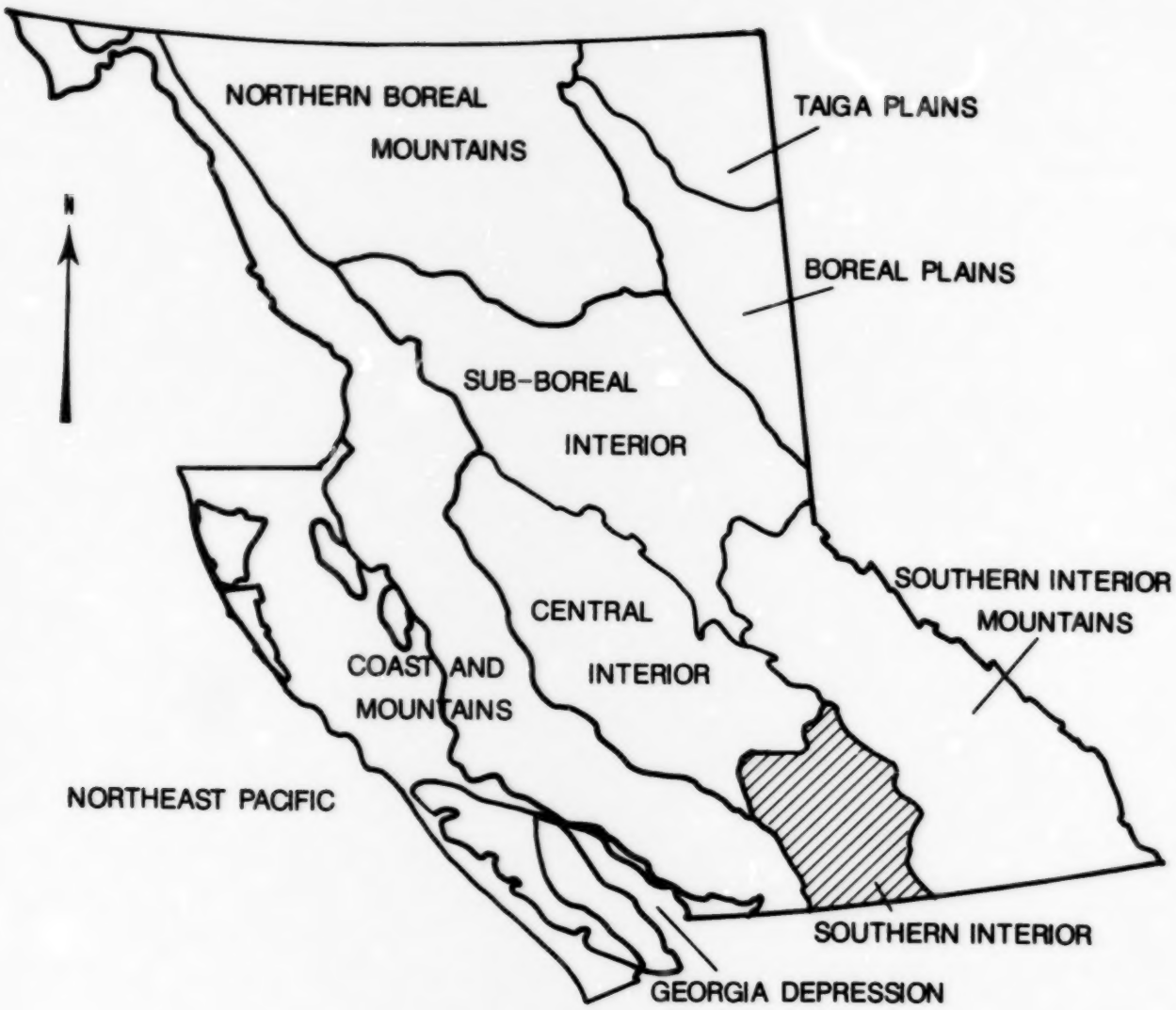



Figure 1. The Southern Interior Ecoprovince.

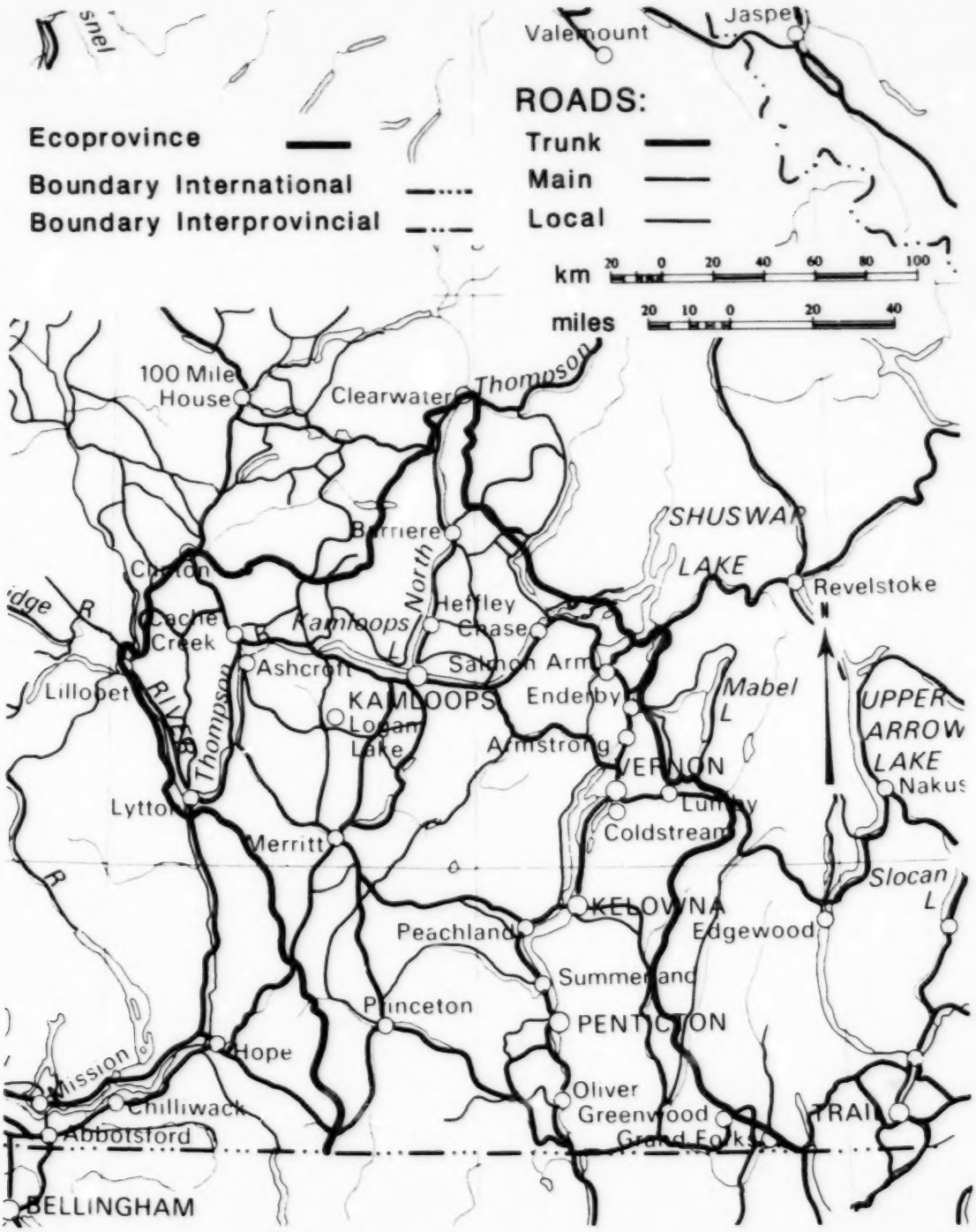



Figure 2. The Southern Interior Ecoprovince.

**Specific Habitat Elements:** site-specific factors that enhance a habitat class for use by a particular species. Includes information on food habits and other details such as a requirement for exposed rocks for sunning or well-drained soil for burrowing.

**Habitat Requirements - Pattern:** when necessary, this section is used to describe the relationship between the various habitat requirements when more than one habitat is required. For example, a species may forage in lowland wet meadows but require nearby shrub cover for hiding.

**Territory/Home Range:** includes information on territory and home range sizes, when known, sometimes stratified by age and/or sex class. Territory is defined as part of the home range defended against other species or members of the same species. Home range is the area covered by an individual animal carrying out its life requisites.

**Activity and Movement Patterns:** includes daily and seasonal activity patterns, migration, and juvenile dispersal.

**Status:** includes a designation (not in jeopardy, special, threatened, endangered, or indeterminate) based on Munro and Low (1979) and Orchard (1984), and legal status. If no legal status is mentioned, the species is not protected by the current laws.

**Other:** miscellaneous comments relating to niche, relationship to other vertebrates, specific management recommendations, etc.

**Selected References:** a short list of references, for additional or more detailed information.

**Distribution Maps:** accompany each species note and show the approximate provincial distribution. Maps were based primarily on *Amphibians and Reptiles of B.C.: An Ecological Review* (Orchard 1984).

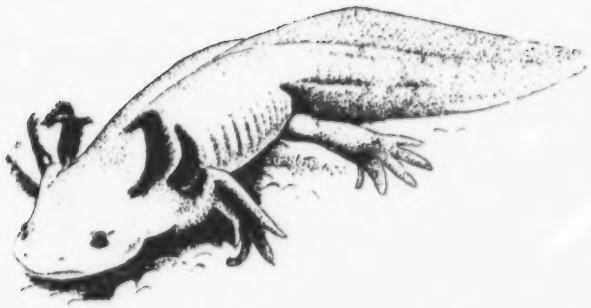
The Royal British Columbia Museum is undertaking a vertebrate atlas program that will provide up-to-date information on the life history and distribution of all British Columbia amphibians. This information will be incorporated into future wildlife habitat handbooks.

Finally, a glossary (Appendix 5.3) is provided to define some of the terms used in the amphibian species notes.

# 2
# Species Notes

# 2.0 SPECIES NOTES

Amphibians are usually associated with damp forests and aquatic habitats, but a special segment of the province's amphibian fauna has invaded the dry valleys of the Southern Interior Ecoprovince. Most of these are habitat generalists who range widely in and out of the Ecoprovince wherever water is available, but one species is a characteristic element of the Great Basin desert fauna. The adaptations of the Great Basin Spadefoot Toad *(Scaphiopus intermontanus)* enable it to survive and thrive in the driest of conditions.



# Long-toed Salamander
# AMMA

*Ambystoma macrodactylum* (Baird)
[Western Long-toed Salamander,
Eastern Long-toed Salamander,
Northern Long-toed Salmander]

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**Distribution, Seasonality, and Abundance**

Native yearlong resident. Generally distributed from sea level to alpine zones across most of the province.

**Habitat Requirements - Reproduction**

HABITAT CLASSES: Courtship, mating, and subsequent larval development occurs in temporal pools or at the edges of quiet permanent water bodies of variable size and thermal range.

SPECIFIC HABITAT ELEMENTS: The eggs are attached to aquatic vegetation and subsurface objects.

**Habitat Requirements - Feeding**

HABITAT CLASSES: Postmetamorphic age classes forage nocturnally in damp, but drained microhabitats. They are especially active on the surface during rainy periods. Daylight is passed beneath surface debris, decaying logs, or underground. The foraging activity of the larvae is entirely aquatic.

SPECIFIC HABITAT ELEMENTS: Adults and metamorphosed juveniles prey on terrestrial invertebrates. Larvae prey on aquatic invertebrates.

**Habitat Requirements - Special Needs**

SPECIFIC HABITAT ELEMENTS: Rocks, rodent burrows, surface vegetation, and decaying logs provide retreats from daylight, desiccation, and temperature extremes.

**Habitat Requirements - Pattern**

Reproductive age classes require the juxtaposition of terrestrial foraging habitat to aquatic reproductive habitat.

**Territory/Home Range**

Unknown.

**Activity and Movement Patterns**

Nocturnal. Adults and metamorphosed juveniles hibernate on land. Larvae generally metamorphose within the first year; however, at higher altitudes the larvae may defer metamorphosis until their second year.

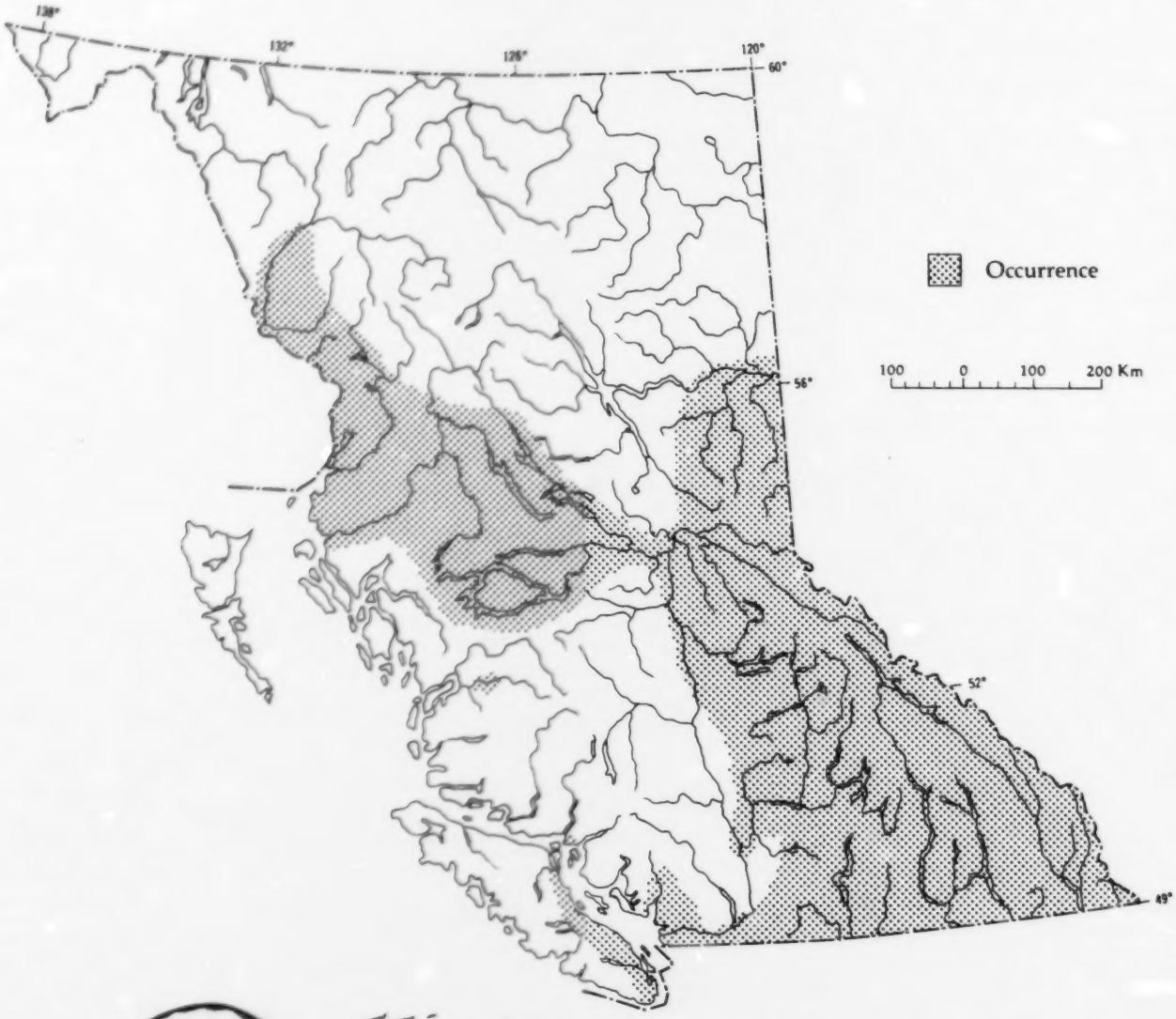
**Status**

Not in jeopardy (Orchard 1984). No official legal status.

**Selected References**

Ferguson 1961, 1963; Orchard 1984; Stebbins 1951.

# Long-toed Salamander



# Tiger Salamander
# AMTI
## *Ambystoma tigrinum* (Green)
## [Blotched Tiger Salamander]

**Distribution, Seasonality, and Abundance**

Native yearlong resident. Found in lakes and ponds and adjacent terrestrial habitats in the southern Okanagan Valley.

**Habitat Requirements - Reproduction**

HABITAT CLASSES: Courtship, mating, egg deposition, and larval development occur in lacustrine and pond habitat classes. Metamorphosed adults migrate to breeding sites from adjacent terrestrial habitats. A variable percentage of the breeding population may be permanently aquatic (neotenic).

SPECIFIC HABITAT ELEMENTS: Eggs are deposited in water and are attached to vegetation and other subsurface objects.

**Habitat Requirements - Feeding**

HABITAT CLASSES: Metamorphosed adults and juveniles forage on land or in subterranean burrows. Larvae forage in the water.

SPECIAL HABITAT ELEMENTS: Metamorphosed adults and juveniles prey on terrestrial invertebrates. Larvae and neotenic adults prey on aquatic invertebrates.

**Habitat Requirements - Special Needs**

SPECIFIC HABITAT ELEMENTS: Terrestrial age classes hibernate and aestivate in subterreanean burrows, often rodent burrows.

**Habitat Requirements - Pattern**

Reproductive terrestrial adults require the juxtaposition of terrestrial foraging habitat to aquatic breeding sites.

**Territory/Home Range**

Unknown.

**Activity and Movement Patterns**

Nocturnal. Aestivates and hibernates underground. Migrates locally from land to water and back to land during the breeding season.

**Status**

Threatened (Orchard 1984). No official legal status.

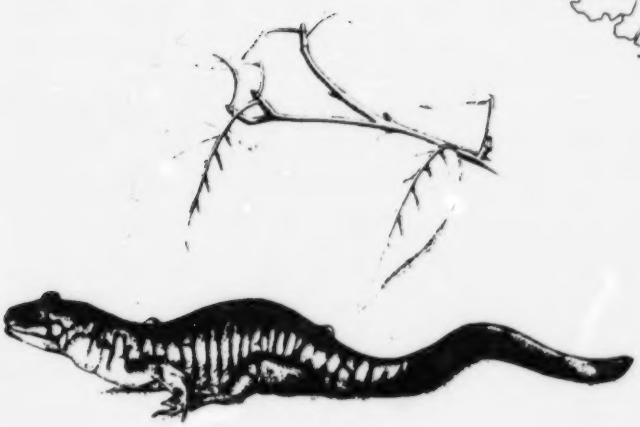
**Other**

Larvae are sometimes harvested for fish bait.

**Selected References**

Gehlbach 1967; Hodge 1972; Orchard 1984; Slater 1934; Stebbins 1951.

# Tiger Salamander



# Roughskin Newt
# TAGR
## *Taricha granulosa* (Skilton)
## [Rough-skinned Newt, Northern Rough-skinned Newt]

**Distribution, Seasonality, and Abundance**

Native yearlong resident. Generally distributed on Vancouver Island and on the adjacent Lower Mainland. Coastal populations extend northward at least as far as the Alaskan Panhandle. Apparently isolated populations are reported in the Kamloops area and at Lillooet.

**Habitat Requirements - Reproduction**

HABITAT CLASSES: Courtship, mating, and egg deposition generally occur in permanent lakes, ponds, fresh water marshes, and slow-moving streams. The larval stage is entirely aquatic.

SPECIFIC HABITAT ELEMENTS: The eggs are deposited in the water and attached to aquatic plants and other submerged objects.

**Habitat Requirements - Feeding**

HABITAT CLASSES: Mature males and larvae forage in the water. Mature females and metamorphosed juveniles forage on land in habitats that are generally shaded by forest.

SPECIFIC HABITAT ELEMENTS: Mature males and larvae prey on the adult and aquatic stages of a variety of insects, as well as crustaceans, worms, and tadpoles. Mature females and metamorphosed juveniles feed on various terrestrial arthropods.

**Habitat Requirements - Special Needs**

SPECIFIC HABITAT ELEMENTS: Terrestrial life stages frequently retreat to subterranean sites or beneath objects on the forest floor.

**Habitat Requirements - Pattern**

Mature females and metamorphosed juveniles hibernate and forage on land, adjacent to aquatic breeding sites. Mature males reside in the water. Females migrate to the water to mate and deposit eggs, then migrate back to land. The larvae are aquatic.

**Territory/Home Range**

Unknown.

**Activity and Movement Patterns**

Active day or night, particularly during rainy periods.

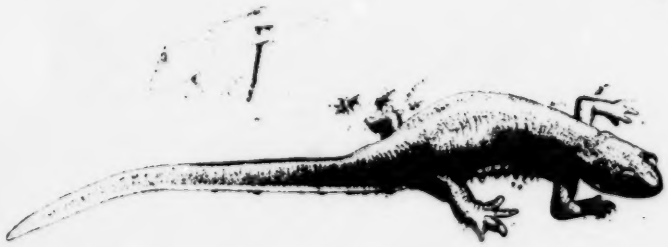
**Status**

Not in jeopardy (Orchard 1984). No official legal status.

**Selected references**

Nussbaum and Brodie, Jr. 1981a, 1981b; Oliver 1974; Oliver and McCurdy 1974; Orchard 1984; Stebbins 1951.

# Roughskin Newt



# Western Toad
# BUBO
## *Bufo boreas* Baird and Girard
## [Boreal Toad]

**Distribution, Seasonality, and Abundance**

Native yearlong resident. Generally distributed from sea level to alpine zones across most of the province.

**Habitat Requirements - Reproduction**

HABITAT CLASSES: Courtship, mating, egg deposition, and subsequent larval development occur in quiet, permanent and temporary water bodies of variable size and thermal range.

SPECIFIC HABITAT ELEMENTS: Eggs are deposited in strings in shallow water where they wind around aquatic vegetation and other subsurface objects.

**Habitat Requirements - Feeding**

HABITAT CLASSES: Terrestrial age classes forage on land. Tadpoles feed in the water.

SPECIFIC HABITAT ELEMENTS: Terrestrial age classes feed on a wide range of terrestrial invertebrates. Tadpoles feed primarily on algae.

**Habitat Requirements - Special Needs**

SPECIFIC HABITAT ELEMENTS: Adults and metamorphosed juveniles withdraw from daylight and low or high temperatures to damp subterranean retreats, generally beneath surface objects or dug into loose soil. Retreats include rocks, rodent burrows, surface vegetation, and decaying logs.

**Habitat Requirements - Pattern**

Reproductive terrestrial adults require the juxtaposition of terrestrial foraging habitat sites to aquatic breeding sites.

**Territory/Home Range**

Unknown.

**Activity and Movement Patterns**

Primarily nocturnal. Aestivates and hibernates underground. Migrates locally from land to water and back to land during the breeding season.

**Status**

Not in jeopardy (Orchard 1984). No official legal status.

**Selected References**

Kennedy 1971; Oliver 1973; Orchard 1984; Stebbins 1951.

# Western Toad

# Pacific Treefrog
# HYRE
## *Hyla regilla* Baird and Girard

**Distribution, Seasonality, and Abundance**

Native yearlong resident. Generally distributed in coastal zones and across the southern interior of the province. Introduced and established on the Queen Charlotte Islands.

**Habitat Requirements - Reproduction**

HABITAT CLASSES: Courtship, mating, egg deposition, and larval development occur in lacustrine, pond, and vernal pool habitat classes. Metamorphosed adults migrate to breeding sites from adjacent terrestrial habitats.

SPECIFIC HABITAT ELEMENTS: Eggs are deposited in shallow water and are attached to vegetation and other subsurface objects.

**Habitat Requirements - Feeding**

HABITAT CLASSES: Metamorphosed adults and juveniles forage terrestrially amongst low vegetation, in damp subterranean retreats, or within stumps or decaying logs.

SPECIFIC HABITAT ELEMENTS: Adults and metamorphosed juveniles prey on flying insects and terrestrial invertebrates. Tadpoles feed primarily on algae.

**Habitat Requirements - Pattern**

Reproductive adults are terrestrial during the non-breeding season and may be found some distance from standing water in a variety of habitats. Standing water is required during the spawning season.

**Territory/Home Range**

Unknown.

**Activity and Movement Patterns**

Breeds nocturnally, otherwise active day or night. Conspicuously active during warm rainy periods. Aestivates and hibernates. Migrates locally during breeding season.

**Status**

Not in jeopardy (Orchard 1984). No official legal status.

**Selected References**

Jameson 1957; Orchard 1984; Schaub and Larsen 1978; Stebbins 1951.

# Pacific Treefrog

# Great Basin Spadefoot Toad
# SCIN
## *Scaphiopus intermontanus* (Cope)
## [Great Basin Spadefoot]

**Distribution, Seasonality, and Abundance**

Native yearlong resident. Distributed throughout the Ponderosa Pine - Bunchgrass biogeoclimatic zone.

**Habitat Requirements - Reproduction**

HABITAT CLASSES: Courtship and spawning occur in the shallows of a temporal water body. The eggs are deposited in lakes, ponds, irrigation ditches, and flooded fields. The brief tadpole stage is aquatic.

**Habitat Requirements - Feeding**

HABITAT CLASSES: Adult and metamorphosed juvenile Great Basin Spadefoot Toads forage on the ground in open ponderosa pine forest, sagebrush steppe, and in and around rocky outcrops and talus slopes. Tadpoles feed in the water.

SPECIFIC HABITAT ELEMENTS: Metamorphosed age classes are insectivorous. The tadpoles are voracious scavengers that feed on plant and animal material and are even cannibalistic.

**Habitat Requiremnts - Special Needs**

SPECIFIC HABITAT ELEMENTS: Post-metamorphic age classes retreat underground during daylight and to withdraw from extreme heat, cold, or dryness. They burrow in loose soil, under rocks and logs, and probably also use rodent burrows.

**Habitat Requirements - Pattern**

Post-metamorphic age classes hibernate, and forage on land. At emergence from hibernation they move to shallow temporal pools to court and to spawn. After spawning they leave the water and remain on land. The tadpole stage is aquatic and brief. The juveniles leave the water at metamorphosis.

**Territory/Home Range**

Unknown.

**Activity and Movement Patterns**

Primarily nocturnal. Hibernates and forages on land. Spawns in water.

**Status**

Threatened (Orchard 1984). Protected wildlife under the British Columbia Wildlife Act (1982).

**Selected references**

Nussbaum *et al.* 1983; Orchard 1984; Stebbins 1951.

# Great Basin Spadefoot Toad

# Northern Leopard Frog
# RAPI
## *Rana pipiens* Schreber
## [Leopard Frog]

**Distribution, Seasonality, and Abundance**

Native yearlong resident. Distributed in the southern Kootenay and Okanagan Valleys. Introduced on Vancouver Island.

**Habitat Requirements - Reproduction**

HABITAT CLASSES: All reproductive activity, including courtship and spawning, occurs in shallow permanent water.

SPECIFIC HABITAT ELEMENTS: Eggs are generally attached to aquatic vegetation just below the surface.

**Habitat Requirements - Feeding**

HABITAT CLASSES: Post-metamorphic age classes forage on land and in the water. Foraging activity of tadpoles is entirely aquatic. Habitats, such as fresh emergent wetlands with abundant littoral vegetation, are preferred by this species.

SPECIFIC HABITAT ELEMENTS: Terrestrial insects form the main part of the diet; however, frogs, snakes, and small birds have also been reported as prey items. Tadpoles graze on algae.

**Habitat Requirements - Special Needs**

SPECIFIC HABITAT ELEMENTS: Hibernates in mud in the floor of the home lake or pond.

**Habitat Requirements - Pattern**

Requires permanent water, preferably with well vegetated edges and mud substrates for hibernation.

**Territory/Home Range**

Unknown.

**Activity and Movement Patterns**

Primarily diurnal, with most activity occurring in or very near to water.

**Status**

Not in jeopardy (Orchard 1984). No official legal status.

**Other**

This species is collected in large numbers and sold for scientific experimentation and educational dissection. Commercial collection of this species is not yet a problem in British Columbia.

**Selected References**

Merrell 1977; Orchard 1984; Stebbins 1951.

# Northern Leopard Frog

# Spotted Frog
# RAPR
## *Rana pretiosa* Baird and Girard

**Distribution, Seasonality, and Abundance**

Native yearlong resident. Generally distributed throughout most of the province except the coastal islands.

**Habitat Requirements - Reproduction**

HABITAT CLASSES: Courtship, spawning, egg deposition, and larval development occur in relatively shallow standing water of lakes, ponds, marshes, rivers, and streams.

SPECIFIC HABITAT ELEMENTS: Eggs are generally deposited in shallows at the water's edge and are not attached to vegetation or other subsurface objects.

**Habitat Requirements - Feeding**

HABITAT CLASSES: Metamorphosed adults and juveniles forage in the water or just at the water's edge. Tadpoles are entirely aquatic.

SPECIFIC HABITAT ELEMENTS: Adults and juveniles feed mostly on insects and secondarily on other invertebrates such as crayfish, sowbugs (pillbugs), millipedes, spiders, and slugs. The tadpoles and froglets of other species are also taken as prey. Tadpoles feed primarily on algae and leafy aquatic plants.

**Territory/Home Range**

Unknown.

**Activity and Movement Patterns**

Primarily diurnal. Hibernates in the water. Rarely moves away from the vicinity of standing water, and then only during rainy periods.

**Status**

Not in jeopardy (Orchard 1984). No official legal status.

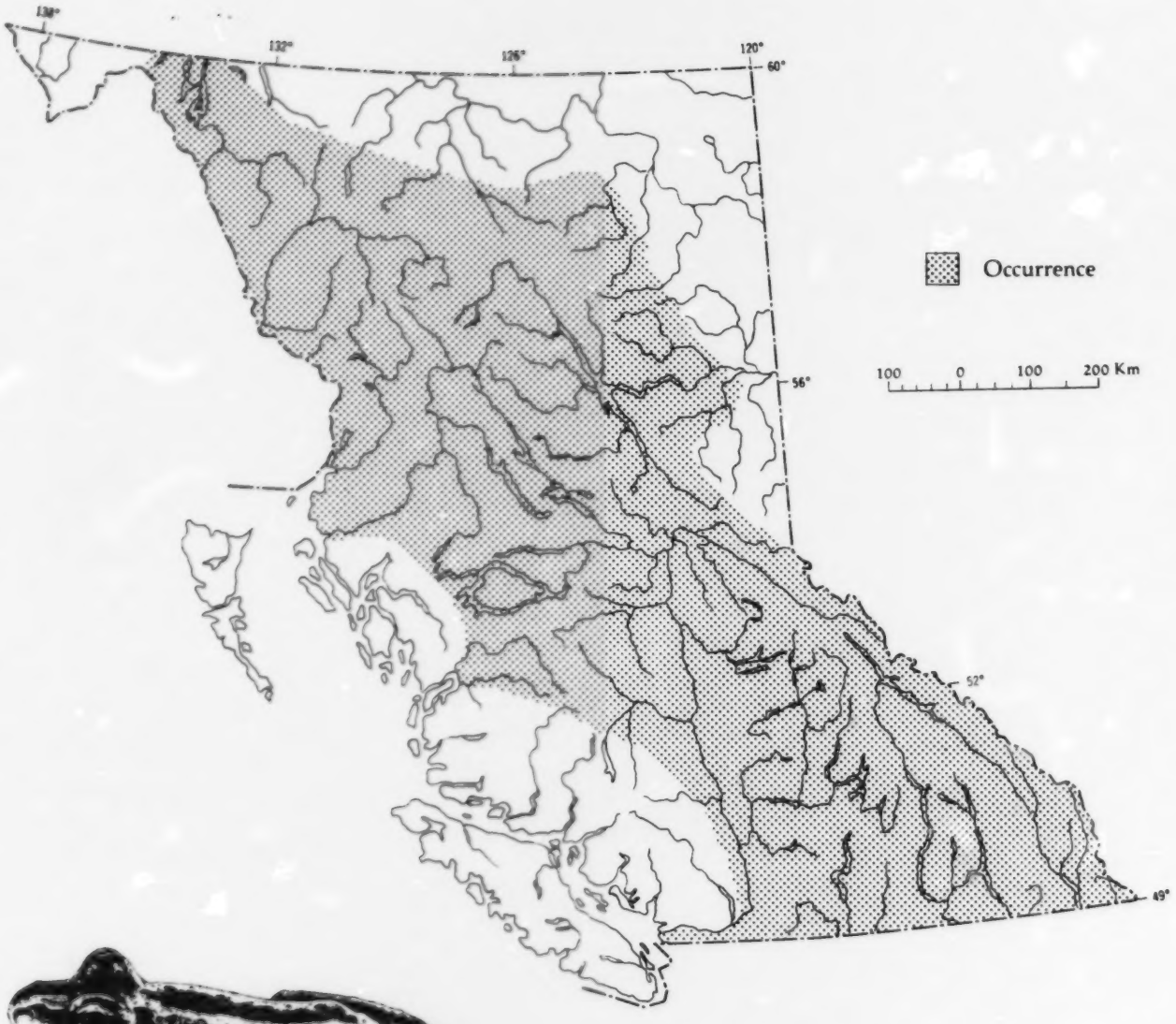
**Other**

Expanding introduced populations of the American Bullfrog *(Rana catesbeiana)* are threatening spotted frog populations in the Lower Mainland.

**Selected References**

Licht 1969, 1971a, 1971b, 1974, 1975; Orchard 1984; Stebbins 1951.

# Spotted Frog



# 3

# References Cited

# 3. REFERENCES CITED


Ferguson, D.E. 1961. The geographic variation of *Ambystoma macrodactylum* Baird, with a description of two new subspecies. Am. Midl. Nat. 65(2):311-338.

Ferguson, D.E. 1963. *Ambystoma macrodactylum*. Catalogue of American Amphibians and Reptiles: 4.1-4.2.

Gehlback, F.R. 1967. *Ambystoma tigrinum*. Catalogue of American Amphibians and Reptiles: 52.1-52.4.

Hodge, R.P. 1972. The waterdog, *Ambystoma tigrinum*, in Washington State. Wash. Wildl. 24(4):6-9.

Jameson, D.L. 1957. Population structure and homing responses in the Pacific tree frog. Copeia 1957(3):221-228.

Kennedy, M.J. 1971. Food and feeding habits of the northwestern toad *Bufo boreas boreas*. B.Sc. Thesis, Dep. of Zool., Univ. of B.C., Vancouver. 27pp.

Licht, L.E. 1969. Comparative breeding behaviour of the red-legged frog *(Rana aurora aurora)* and the western spotted frog *(Rana pretiosa pretiosa)* in southwestern British Columbia. Can. J. Zool. 47:1287-1299.

Licht, L.E. 1971a. The ecology of coexistence in two closely related species of frogs (*Rana*). Ph.D. Thesis, Dep. of Zool., Univ. of B.C., Vancouver. 155pp.

Licht, L.E. 1971b. Breeding habits and embryonic therma requirements of the frogs, *Rana aurora aurora* and *Rana pretiosa pretiosa*, in the Pacific Northwest. Ecology 52(1):116-124.

Licht, L.E. 1974. Survival of embryos, tadpoles, and adults of the frogs *Rana aurora aurora* and *Rana pretiosa pretiosa* sympatric in southwestern British Columbia. Can. J. Zool. 52(5):613-627.

Licht, L.E. 1975. Comparative life history features of the western spotted frog, *Rana pretiosa*, from low- and high-elevation populations. Can. J. Zool. 53(9):1254-1257.

Macartney, M.J. Unpublished information. Dep. of Biol., Univ. of Victoria, Victoria, B.C.

Merrell, D.J. 1977. Life history of the leopard frog, *Rana pipiens*, in Minnesota. Occas. Pap. Bell Mus. Nat. Hist. 15:1-23.

Nace, G.W. 1976. Chapter 8: Standards for laboratory amphibians. Pages 317-327 *in* K.V. Fite (ed.). The amphibian visual system. A multidisciplinary approach. Academic Press, New York.

Nussbaum, R.A., and E.D. Brodie, Jr. 1981a. *Taricha*. Catalogue of American Amphibians and Reptiles: 271.1-271.2.

Nussbaum, R.A., and E.D. Brodie, Jr. 1981b. *Taricha glanulosa*. Catalogue of American Amphibians and Reptiles: 272.1-272.4.

Nussbaum, R.A., E.D. Brodie, Jr. and R.M. Storm. 1983. Amphibians and reptiles of the Pacific Northwest. Univ. of Idaho Press, Moscow, Idaho.

Oliver, M.G. 1973. The western toad on southern Vancouver Island. Victoria Nat. 29(5):49-51.

Oliver, M.G. 1974. Habitat selection and its relation to reproductive development of the rough skinned newt, *Taricha granulosa* (Skilton) on southern Vancouver Island. M.Sc. Thesis, Dep. of Biol., Univ. of Victoria, Victoria, B.C.

Oliver, M.G., and H.M. McCurdy. 1974. Migration, overwintering, and reproductive patterns of *Taricha granulosa* on southern Vancouver Island. Can. J. Zool. 52:541-545.

Orchard, S.A. 1984. Amphibians and reptiles of British Columbia: an ecological review. WHR-15. B.C. Ministry of For., Res. Branch, Victoria. 268pp.

Slater, J.R. 1934. *Ambystoma tigrinum* in the State of Washington. Copeia 1934(4):189-190.

Schaub, D.L., and J.H. Larsen. 1978. The reproductive ecology of the Pacific treefrog *Hyla regilla*. Herpetologica. 34(4):409-416.

Stebbins, R.C. 1951. Amphibians of western North America. Univ. of Calif. Press, Berkeley and Los Angeles, Calif. 539pp.

# 4

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# 5
# Appendices

# 5. APPENDICES

## Appendix 5.1 Taxonomic Listing of Amphibians

The following taxonomic list attempts to follow an acceptable phylogenetic sequence. However, because of lack of standard agreement among herpetologists, all taxons for amphibians are listed alphabetically within orders.

CLASS: AMPHIBIA (Amphibians)

ORDER: CAUDATA (Salamanders)

FAMILY: AMBYSTOMATIDAE (Mole Salamanders)

| | |
|---|---|
| Long-toed Salamander | *Ambystoma macrodactylum* |
| Tiger Salamander | *Ambystoma tigrinum* |

FAMILY: SALAMANADRIDAE (Newts)

| | |
|---|---|
| Roughskin Newt | *Taricha granulosa* |

ORDER: ANURA (Frogs and Toads)

FAMILY: BUFONIDAE (Toads)

| | |
|---|---|
| Western Toad | *Bufo boreas* |

FAMILY: HYLIDAE (Treefrogs)

| | |
|---|---|
| Pacific Treefrog | *Hyla regilla* |

FAMILY: PELOBATIDAE (Spadefoot Toads)

| | |
|---|---|
| Great Basin Spadefoot Toad | *Scaphiopus intermontanus* |

FAMILY: RANIDAE (True Frogs)

| | |
|---|---|
| Northern Leopard Frog | *Rana pipiens* |
| Spotted Frog | *Rana pretiosa* |

# Appendix 5.2
# General Amphibian Texts

Carl, G.C., and C.J. Guiguet. 1972. Alien animals in British Columbia (2nd edition). British Columbia Provincial Museum Handbook No. 14, Victoria, B.C. 103pp.

Collins, J.T., J.E. Huheey, J.L. Knight, and H.M. Smith. 1978. Standard common and current scientific names for North American amphibians and reptiles. Society for the Study of Amphibians and Reptiles Herpetological Circular 12:1-36.

Cook, F.R. 1984. Introduction to Canadian amphibians and reptiles. National Museum of Natural Sciences, National Museums of Canada, Ottawa Ont. 199pp.

Green, D.M., and R.W. Campbell. The amphibians of British Columbia. British Columbia Provincial Museum. Handbook 45. Victoria, B.C. 101pp.

Munro, W.T., and D.J. Low. 1980. Preliminary plan for the designation of threatened and endangered species in British Columbia. Pages 65-73 *in* R. Stace-Smith, L. Johns, and P. Joslin. Proceedings of the symposium on threatened and endangered species and habitats in British Columbia and the Yukon. British Columbia Ministry of Environment, Fish and Wildlife Branch, Victoria, B.C.

Nussbaum, R.A., E.D. Brodie, Jr., and R.M. Storm. 1983. Amphibians and reptiles of the Pacific Northwest. University Press of Idaho, Moscow, Idaho.

Orchard, S.A. 1984. Amphibians and reptiles of B.C.: an ecological review. WHR-15. B.C. Ministry of Forests, Research Branch, Victoria. 268pp.

Stebbins, R.C. 1966. A field guide to western reptiles and amphibians. Houghton Mifflin Co., Boston. 279pp.

# Appendix 5.3
# Glossary

**Aestivate:** The condition in which an organism may pass the summer and in which its normal activities are greatly curtailed or temporarily suspended.

**Arthropod:** An animal in the Phylum Arthropoda such as insects, crabs, spiders, or centipedes.

**Diurnal:** Refers to daytime in contrast to Nocturnal.

**Froglet:** A life stage of frogs between the larval tadpole stage and the sexually mature adult.

**Invertebrate:** An animal lacking a spinal column, e.g., insects.

**Hibernation:** A state of dormancy during winter.

**Larva:** A structurally distinct intermediate stage in the development of many amphibians that reproduce in water. It is usually totally aquatic, gill-breathing and occupies the interval between the egg stage and metamorphosis.

**Metamorphosis:** The transformation from larval to adult condition in amphibians.

**Microhabitat:** A small habitat, e.g., a tree stump.

**Neoteny:** A condition in which sexual maturity is attained by a non-metamorphosed individual or when metamorphosis is delayed, with larval characteristics being retained longer than usual.

**Nocturnal:** Refers to night time.

**Spawning:** The act of depositing eggs into water and their simultaneous fertilization.

**Tadpole:** The larval stage of a frog.

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